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United States Patent [19][11] **Patent Number:** **5,121,329****Crump**[45] **Date of Patent:** **Jun. 9, 1992****[54] APPARATUS AND METHOD FOR CREATING THREE-DIMENSIONAL OBJECTS**[75] Inventor: **S. Scott Crump**, Minnetonka, Minn.[73] Assignee: **Stratasys, Inc.**, Minneapolis, Minn.[21] Appl. No.: **429,012**[22] Filed: **Oct. 30, 1989**[51] Int. Cl.⁵ **G06F 15/46**[52] U.S. Cl. **364/468; 364/474.24; 364/477; 264/239; 264/25; 425/174.4**[58] **Field of Search** **364/472, 473, 477; 264/308, 113; 425/174.4; 427/8, 52; 164/94; 239/75, 82, 83, 84, 132****[56] References Cited****U.S. PATENT DOCUMENTS**

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[57] ABSTRACT

Apparatus incorporating a movable dispensing head provided with a supply of material which solidifies at a predetermined temperature, and a base member, which are moved relative to each other along "X," "Y," and "Z" axes in a predetermined pattern to create three-dimensional objects by building up material discharged from the dispensing head onto the base member at a controlled rate. The apparatus is preferably computer driven in a process utilizing computer aided design (CAD) and computer-aided (CAM) software to generate drive signals for controlled movement of the dispensing head and base member as material is being dispensed.

Three-dimensional objects may be produced by depositing repeated layers of solidifying material until the shape is formed. Any material, such as self-hardening waxes, thermoplastic resins, molten metals, two-part epoxies, foaming plastics, and glass, which adheres to the previous layer with an adequate bond upon solidification, may be utilized. Each layer base is defined by the previous layer, and each layer thickness is defined and closely controlled by the height at which the tip of the dispensing head is positioned above the preceding layer.

44 Claims, 3 Drawing Sheets